IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	Attorney Docket No.: **AOYAMA0002**
	)	
Keiichiro OISHI	)	Confirmation No.: 2997
	)	
Serial No.: 10/597,568	)	Group Art Unit: 1793
	)	
Filed: July 31, 2006	)	Examiner: Sikyin IP
	)	
For: MASTER ALLOY FOR CASTING A MODIFIED COPPER ALLOY AND CASTING METHOD USING THE SAME	)	Date: Revised Draft

DECLARATION UNDER 37 C.F.R. § 1.132 OF KEIICHIRO OISHI

U.S. Patent and Trademark Office
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

1. I, Keiichiro Oishi, the undersigned, state that I am a ~~director~~ general manager of Research & Development Department ~~in~~, Sambo ~~Plant,~~ Mitsubishi Shindoh Co. Ltd. and that I am the inventor of the subject matter of the above-captioned application, which is assigned to SANBO SHINDO KOGYO KABUSHIKI KAISHA. I am an expert in the field of metallurgy. My curriculum vitae is attached hereto as ***Exhibit A-1***.

2. I am familiar with the above-captioned application and claims as amended by Amendment (E) filed concurrently herewith. A copy of the claims as amended by Amendment (E) is attached hereto as an Appendix. I have reviewed the Office Actions issued in the above-captioned U.S. patent application by the Examiner on October 1, 2009 and January 13, 2010. I have also reviewed the subject matter disclosed by JP 04-099837

filed by Hatano et al. (hereafter the "Hatano document," of record). In this declaration, I submit my expert opinion as follows: (i) that the Hatano document does **not** disclose a master alloy for obtaining a copper alloy cast as recited in independent claims 14 and 19, in particular, the reference does not disclose a master alloy having the amount of Cu in the claimed range of 40 weight % to 80 weight % (hereafter, "wt.%"); and (ii) that the Hatano document does **not** disclose the grain size of refined grains of a copper alloy cast, 50μm or less, as recited in claims 34-35 and new claims 40-41.

3. In rendering my opinion I have considered (a) the specification and claims of the above-captioned application (as amended by Amendment (E)), (b) the Hatano document, of record, (c) the Office Action dated October 1, 2009, of record, (d) the Office Action dated January 13, 2010, of record, and (e) pages 413 and 874 of The Kodansha Japanese-English Dictionary, Kodansha, Tokyo, 1985 (hereafter the "Kodansha Japanese-English Dictionary"), filed herewith as Exhibit A-2, which are sources of information an expert in the field would reasonably rely upon in rendering an opinion regarding the subject matter of this declaration.

4. Based on my own knowledge and experience in the art, and my review of the materials referenced above, it is my expert opinion that Hatano document discloses an alloy having a Cu content of at least about 90.9 wt.%. That is, Hatano discloses an alloy **outside** the range of 40 wt.% to 80 wt.%, as claimed.

Applicant's Disclosure as Originally Filed

5. The present invention broadly relates to a master alloy for obtaining a copper alloy cast (Applicant's disclosure as originally filed, p. 1, lines 6-7). The master alloy according to claim 14 of present application, consists of: (i) "(a) Cu: 40 to 80 wt.%; (b) Zr: 0.5 to 35 wt.%; (c) at least one element selected from the group consisting of Mg: 0.01 to 1 wt.%, Sn: 0.1 to 5 wt.%, B: 0.01 to 0.5 wt.%, Mn: 0.01 to 5 wt.% and Si: 0.01 to 1 wt.%; and (d) the balance of Zn. " As recited in independent claim 19, the master alloy consists of (ii) "(a) Cu: 40 to 80 wt.%; (b) Zr: 0.5 to 35 wt.%; (c) P: 0.01 to 3 wt.%; (d) at least one element selected from the group consisting of Mg: 0.01 to 1 wt.%, Sn: 0.1 to 5 wt.%, B: 0.01 to 0.5 wt.%, Mn: 0.01 to 5 wt.% and Si: 0.01 to 1 wt.%; and (e) the balance of Zn."

The Hatano document

6. The Hatano document relates to a conductive material, such as an alloy (The Hatano document, p. 219, col. 1, lines 5-14). The alloy as described in the Hatano document has Cu with inevitable impurities (p. 219, col. 1, lines 5-14). Based on my knowledge and experience in the art, a person of ordinary skill in the art would know that inevitable impurities of any alloy are generally present in no more than about 0.1 wt.% in total. In addition, Cu content constitutes the remainder of the alloy on the ground that the term, 残部 or 残(り), in Japanese, as disclosed on p. 219, col. 1, lines 5-14 and p. 220, col. 1, lines 4-13, and Table 1 of the Hatano document, which means "the remainder" or "the remnant" in English (see Exhibit A-2 as attached). A person of ordinary skill in the art would therefore also calculate the amount of Cu in the alloy of the Hatano document by subtracting (1) the amount of inevitable impurities being generally about 0.1 wt.% or less; and (2) the amount of other elements except for copper, from total amount of the alloy being 100 wt.%.

7. Calculation based on samples 6, 8 and 9 on Table 1 of the Hatano document

Using the above calculation, and based on my knowledge and experience in the art, I believe that alloy samples 6, 8 and 9 as shown on Table 1 of the Hatano document, contain the amount of Cu of at least about 96.03 wt.%, 97.02 wt.% and 96.05 wt.%, respectively. The wt.% of the respective remainder Cu as calculated in samples 6, 8 and 9, and wt.% of other elements, are summarized in Table A, reproduced below.

Table A: Data Compiled from Table 1 of the Hatano document

		Chemical Composition (wt.%)					
		Cu	Inevitable Impurities (present in Cu)	Zr	Zn	Additional Element	Total Amount
Sample	6	At least about **96.03**	About 0.1 wt.% or less	0.56	2.89	0.02P, 0.4Mn	100
	8	At least about **97.02**	About 0.1 wt.% or less	0.82	1.20	0.21Sn, 0.56Mg, 0.09Si	100
	9	At least about **96.05**	About 0.1 wt.% or less	0.95	2.49	0.41Si	100

Based on the above calculation, I conclude that the Cu content of samples 6, 8 and 9 is at least about 96.03 wt.%, 97.02 wt.% and 96.05 wt.%, respectively. That is, the Cu content disclosed in Hatano is **outside** the claimed range of 40 wt.% to 80 wt.%.

8. Calculation based on Patent Abstracts of Japan and p. 220, col. 3, lines 4-13 of the Hatano document

Using the above calculation, and based on my knowledge and experience in the art, I believe that the alloy as disclosed in Patent Abstracts of Japan and p. 220, col. 3, lines 4-13 of the Hatano document, contains an amount of Cu of at least about 90.9 to 99.74 wt.%.

The wt.% of the remainder Cu as calculated in the alloy and wt.% of other elements, are summarized in Table B, reproduced below.

Table B

	Chemical Composition (wt.%)					
	Cu	Inevitable Impurities (present in Cu)	Zr	Zn	Additional Element	Total Amount
Alloy	At least about **90.9 to 99.74**	About 0.1 wt.% or less	0.05 to 1.0	0.1 to 5.0	Total, 0.01 to 3.0	100

Based on the above calculation, I conclude that the Cu content of the alloy is at least about 90.9 wt.% to 99.74 wt.%, **outside** the claimed range of 40 wt.% to 80 wt.%.

9. Calculation based on p. 219, col. 1, lines 4-13 of the Hatano document

Using the above calculation, and based on the above facts and my knowledge and experience in the art, I believe that the first alloy and the second alloy, as disclosed on p. 219, col. 1, lines 4-13 of the Hatano document, contain an amount of Cu of at least about 93.9 to 99.75 wt.% and at least about 90.9 to 99.74 wt.%, respectively. Wt.% of the respective remainder Cu as calculated in the first alloy and the second alloy, and wt.% of other elements, are summarized in Table C, reproduced below.

Table C

	Chemical Composition (wt.%)					
	Cu	Inevitable Impurities (present in Cu)	Zr	Zn	Additional Element	Total Amount
First Alloy	At least about **93.9 to 99.75**	About 0.1 wt.% or less	0.05 to 1.0	0.1 to 5.0	Total, 0	100
Second Alloy	At least about **90.9 to 99.74**	About 0.1 wt.% or less	0.05 to 1.0	0.1 to 5.0	Total, 0.01 to 3.0	100

Based on the above calculation, I conclude that the Cu content of the first alloy and the second alloy is at least about 93.9 wt.% to 99.75 wt.% and at least about 90.9 wt.% to 99.74 wt.%, respectively, that is, **outside** the claimed range of 40 wt.% to 80 wt.%.

10. <u>The Examiner's Inherency Argument</u>

The Examiner contends that since the claimed alloy are formed by conventional casting method, the claimed grain size would have been inherently possessed by the material (disclosed in the Hatano document) and casting (Office Action, dated October 1, 2009, at p. 4, lines 6-7), and Applicant has not shown the recited grain size would not be in the prior art Cu alloy (Office Action, dated January 13, 2010, at p. 2, line 5). However, the copper alloy cast according to claims 34-35 and new claims 40-41 of the present application is produced via specific casting techniques, **different** from a conventional casting method.

11. For example, it is necessary to obtain refined grains having a grain size of 50μm or less, as claimed, that the concentration of metal Zr (in the molten master alloy during

casting process) should be controlled in the range of 5 ppm or more, preferably, 20 to 500 ppm. This is very difficult to achieve using a conventional casting method. See Applicant's original disclosure, p. 6, line 15 to p. 7, line 18 and p. 9, lines 2-12. Further, in order to obtain refined grains having the grain size of 50μm or less as claimed, when the master alloy according to claims 14 or 19 is cast, electrolytic Cu, electrolytic Zn and electrolytic Sn, and the like are melted in the molten master alloy. See Applicant's original disclosure, p. 33, line 24 to p. 34, line 15. Therefore, the resulting copper alloy cast includes such electrolyte metals, different from a copper alloy cast obtained by a conventional casting method. In addition, the Cu content of the master alloy in present invention is outside the claimed range, 40 wt.% to 80 wt.%. Based on my own knowledge and the above disclosure, a person of ordinary skill in the art would conclude that the alloy as disclosed in the Hatano document would not have same grain size, i.e., 50μm or less, as claimed.

12. Based on all of the above facts, and based on my own knowledge and belief, I conclude that the Hatano document does **not** disclose a master alloy for obtaining a copper alloy cast as recited in independent claims 14 and 19, because the Hatano document neither teaches, nor suggests, a master alloy having an amount of Cu in the range of 40 wt.% to 80 wt.%, as claimed. I also conclude that the Hatano document does **not** disclose a master alloy, wherein after casting, refined grains in the resulting copper alloy cast of the mater alloy have a grain size of 50μm or less, as recited in claims 34-35 and new claims 40-41, because an alloy disclosed in the Hatano document would not inherently possess the claimed grain size after casting. Furthermore, based on the above facts, it is my expert opinion that the Hatano document discloses an alloy containing the amount of Cu of least about 90.9 wt.%, that is, **outside** the claimed range of Cu, i.e., 40 wt.% to 80 wt.%.

Summary

13. It is my expert opinion, based on the materials and evidence I have considered, that:

a. the Hatano document does not disclose a master alloy for obtaining a copper alloy cast as recited in independent claims 14 and 19, in particular, a master alloy having Cu content in the range of 40 wt.% to 80 wt.%, as claimed;

b. the Hatano document does not disclose that when a master alloy is cast, that the resulting copper alloy cast includes refined grains having a grain size of 50μm or less, as recited in claims 34-35 and new claims 40-41; and

c. the Hatano document discloses an alloy containing the amount of Cu of least about 90.9 wt.%, outside the range of Cu, i.e., 40 wt.% to 80 wt.%, as claimed.

14. I declare under penalty of perjury that the foregoing is true and correct, that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Further Declarant sayeth not:

Date: April 27, 2010

Keiichiro Oishi

Keiichiro Oishi

APPENDIX:

LISTING OF CLAIMS

Claims 1-13 are cancelled.

14. A master alloy for obtaining a copper alloy cast, consisting of:

(a) Cu: 40 to 80 wt.%;

(b) Zr: 0.5 to 35 wt.%;

(c) at least one element selected from the group consisting of Mg: 0.01 to 1 wt.%, Sn: 0.1 to 5 wt.%, B: 0.01 to 0.5 wt.%, Mn: 0.01 to 5 wt.% and Si: 0.01 to 1 wt.%; and

(d) the balance of Zn.

15-17. (Cancelled)

18. The master alloy for obtaining a copper alloy cast according to claim 14,

wherein said master alloy is an ingot formed in a shape of a boat, continuous casting material formed in a shape of a rod or wire, or hot extrusion material formed in a shape of a rod or wire.

19. A master alloy for obtaining a copper alloy cast, consisting of:

(a) Cu: 40 to 80 wt.%;

(b) Zr: 0.5 to 35 wt.%;

(c) P: 0.01 to 3 wt.%;

(d) at least one element selected from the group consisting of Mg: 0.01 to 1 wt.%, Sn: 0.1 to 5 wt.%, B: 0.01 to 0.5 wt.%, Mn: 0.01 to 5 wt.% and Si: 0.01 to 1 wt.%; and

(e) the balance of Zn.

20-21. (Cancelled)

22. The master alloy for obtaining a copper alloy cast according to claim 19, wherein said master alloy is an ingot formed in a shape of a boat, continuous casting material formed in a shape of a rod or wire, or hot extrusion material formed in a shape of a rod or wire.

23-33. (Cancelled)

34. The master alloy for obtaining a copper alloy cast according to claim 14, wherein when the master alloy is cast, the resulting copper alloy cast includes refined grains having a grain size of 50μm or less.

35. The master alloy for casting a copper alloy according to claim 19, wherein when the master alloy is cast, the resulting copper alloy cast includes refined grains having a grain size of 50μm or less.

36. A master alloy for casting a copper alloy, consisting of:

Cu: 40 to 80 wt.%;

Zr: 0.5 to 35 wt.%;

at least one element selected from the group consisting of Mg: 0.01 to 1 wt.%, Sn: 0.1 to 5 wt.%, B: 0.01 to 0.5 wt.%, Mn: 0.01 to 5 wt.% and Si: 0.01 to 1 wt.%; and

the balance of Zn,

wherein said Cu occupies 50 to 65 wt.%, and said Zr occupies 1 to 10 wt.%.

37. A master alloy for casting a copper alloy, consisting of:

Cu: 40 to 80 wt.%;

Zr: 0.5 to 35 wt.%;

P: 0.01 to 3 wt.%;

at least one element selected from the group consisting of Mg: 0.01 to 1 wt.%, Sn: 0.1 to 5 wt.%, B: 0.01 to 0.5 wt.%, Mn: 0.01 to 5 wt.% and Si: 0.01 to 1 wt.%; and

the balance of Zn,

wherein said Cu occupies 50 to 65 wt.%, and said Zr occupies 1 to 10 wt.%.

38. The master alloy for obtaining a copper alloy cast according to claim 34, wherein 0.2% proof strength of the resulting copper alloy cast is improved by 10% or more, comparing to a copper alloy cast obtained without grain refinement.

39. The master alloy for obtaining a copper alloy cast according to claim 35, wherein 0.2% proof strength of the resulting copper alloy cast is improved by 10% or more, comparing to a copper alloy cast obtained without grain refinement.

40. A copper alloy cast obtained by using the master alloy according to claim 14, wherein the copper alloy cast includes refined grains having a grain size of 50μm or less.

41. A copper alloy cast obtained by using the master alloy according to claim 19,

wherein the copper alloy cast includes refined grains having a grain size of 50μm or less.

42. The copper alloy cast according to claim 40, wherein 0.2% proof strength of the copper alloy cast is improved by 10% or more, comparing to a copper alloy cast obtained without grain refinement.

43. The copper alloy cast according to claim 41, wherein 0.2% proof strength of the copper alloy cast is improved by 10% or more, comparing to a copper alloy cast obtained without grain refinement.

EXHIBIT A-1

CURRICULUM VITAE

As of April 15, 2010

Name: **Keiichiro Oishi**
Date of Birth: 12 January 1955 Aged: 55
Address: 1-108 Yuge-cho Yao-shi, Osaka Japan
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WORKING EXPERIENCE

Feb. 2010 – Present : Fellow, Deputy General Manager R&D and Prod. Eng. Div., General Manager Sambo R&D Dept.
April 2008 – Jan. 2010 : Fellow, General Manager R&D Dept. Sambo Plant, MITSUBISHI SHINDOH Co., Ltd.(*)
April 2005 – March 2008 : Fellow, General Manager of R&D Center
March 1998 – March 2005 : General Manager of R&D Center
April 1995 – Feb. 1998 : Manager Technical Department
April 1978 – March 1995 : Technical Department, SAMBO COPPER ALLOY Co., Ltd.
1978 – 2008 SAMBO COPPER ALLOY Co., Ltd.

note (*) : SAMBO COPPER ALLOY Co, Ltd. was merged with and into MITSUBISHI SHINDOH Co., Ltd. on April 1, 2008.

EDUCATION

2003	PhD in Engineering (Osaka University)
1974-1978	Osaka University – Faculty of Engineering, Metallurgy Dept.
1973	Graduated from Osaka Prefectural Otemae High School

Field of Research and Major Accomplishments: Development of environment-conscious copper-base alloys at MITSUBISHI SHINDOH Co., Ltd. (ex-SAMBO COPPER ALLOY Co., Ltd. since April 1980

Academic Societies Involved:

- Councilor, The Japan Society for Technology of Plasticity, Kansai Region, 2001
- Governing Board, Japan Copper and Brass Association, 2000
- Planning Board, The Japan Institute of Metals (Kansai Branch), 1999
- Steering Committee, The Japan Institute of Metals (Kansai Branch), 1996

Number of Research Papers: 36 (including 2 on currently posting)

Awards: 14 papers

Reward and Punishment: none

Awards

Date	Organization	Paper Title
Apr. 1989	The Japan Institute of Metals	Whisker Grown on Surface of Tin Used to Cast Todaiji Great Buddha
Sep. 1989	The Japan Institute of Metals	Wettability of solid oxides by liquid pure metals
Nov. 1993	Japan Copper and Brass Association	Development of β-Brass Single Crystals and Abnormal Growth of Crystal Grains
Nov. 1995	The Matrials Process and Technology Center	Development of Dezincfication-resistant Brass and Its Application for Forged Valve
Nov. 1996	Japan Copper and Brass Association	Basic Study of Fatigue Characteristics of Extruded Brass Materials
Nov. 1997	Japan Institute of Invention and Innovation	Development of Dezincification Brass Forged Valve
Oct. 2000	The Japan Institute of Metals	Development of 'ECOBRASS' Lead-free Copper Alloy
Nov. 2003	Japan Copper and Brass Association	Development of Grain Refined High-Strength Copper Alloy
Sep. 2004	The Japan Institute of Metals	Development of High-Strenght Grain Refined Copper Alloy "SFG"
Nov. 2004	The Matrials Process and Technology Center	Development of Lead-Free Copper Alloy (Cu-Si-Zn Alloy) for Casting, Forging and Machining
Nov. 2007	Japan Copper and Brass Association	Development of 76Cu-3Si-21Zn Alloy Castings with Fine Grain
Sep. 2007	The Japan Institute of Metals	Development of Lead-Free Grain Refined Copper Alloy Castings "ECOBRASS"
May 2008	Japan Copper and Brass Association	Development of ECOBRASS
Sep. 2009	The Japan Institute of Metals	Development of High Strength Copper Tube "HRSC" with High Pressure Resistance